

### Trend Study 30-29-03

Study site name: Southwest of New Castle.

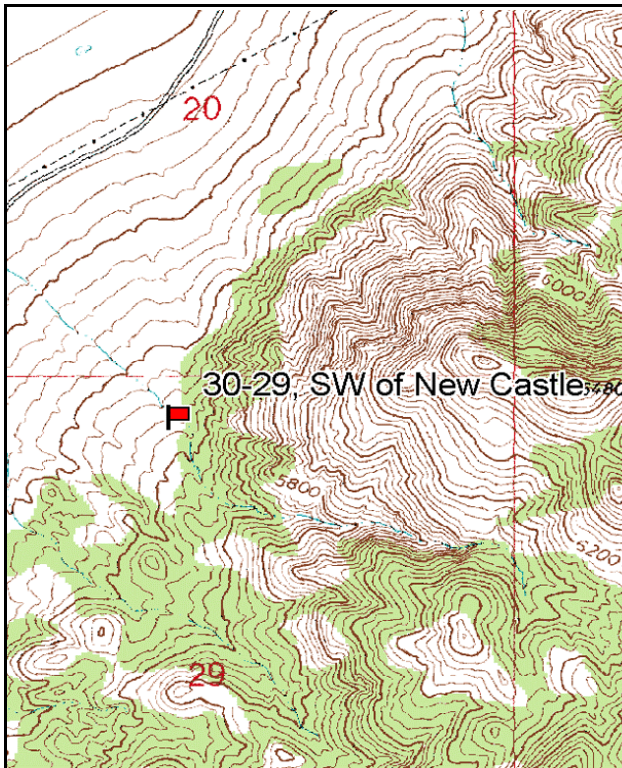
Vegetation type: Sagebrush-Grass.

Compass bearing: frequency baseline 176 degrees magnetic.

Frequency belt placement: line 1 (12 & 92ft), line 2 (39ft), line 3 (50ft), line 4 (79ft). Rebar: All belts on 1ft.

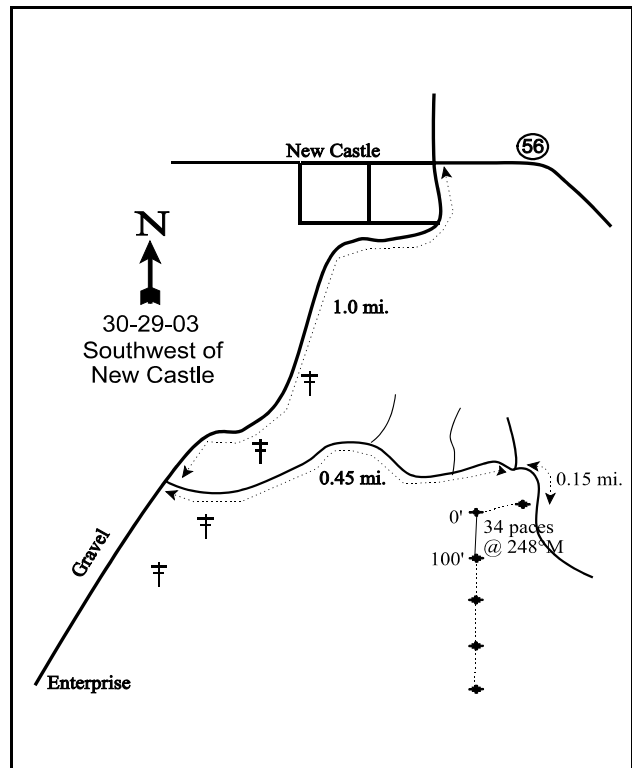
### LOCATION DESCRIPTION

From the intersection of Pinto-Canyon Road and Main Street in New Castle, proceed south on Main Street 1.0 mile towards Enterprise. Turn left (east) and travel 0.45 miles until you come to a fork. Take a right and continue 0.15 miles to a witness post on the right side of the road. From the witness post walk 34 paces at 248 degrees magnetic to the 0-foot stake. The study is marked by green steel "T" fence posts approximately 18 to 24 inches in height.



Map Name: New Castle

Township 36S, Range 15W, Section 20



Diagrammatic Sketch

GPS: NAD 27, UTM 12S 4169413 N, 274301 E

## DISCUSSION

### Southwest of Newcastle - Trend Study No. 30-29

This range trend study surveys severe winter range southwest of the town of Newcastle. The site is an alluvial fan occupied by Wyoming big sagebrush underlain by a sparse herbaceous understory. The terrain has a slope of 11% and an aspect toward the west-northwest at an elevation of approximately 5,600 feet. Pellet group data taken on the site in 1998 estimated 68 deer days use/acre (168 ddu/ha). Most of the deer pellet groups appeared to be from winter use. Pellet group data from 2003 estimated 58 deer days use/acre (144 ddu/ha). No sign of cattle grazing was noted during either reading.

Soil is alluvially deposited from basalt parent material. Effective rooting depth is estimated at just over 15 inches. Soil texture is a sandy clay loam which is slightly acidic (pH 6.4). Soil temperature was moderately high in 2003, averaging 65°F at an average depth of 11 inches. This temperature was recorded on May 21<sup>st</sup> and demonstrates a relatively dry soil profile. Drought conditions have been especially pronounced in this area. The surface of the soil is covered by gravel 1/4" to 2" inches in size with some larger rocks mixed in. Rock is also common throughout the profile. Bare ground mostly occurs in small shrub interspaces associated with the rocky surface. Ground cover is composed mostly of shrub crowns and ephemeral litter from dead cheatgrass. Soil movement was widespread in 1982 with several small rills and gullies present. Currently, erosion appears minimal and the erosion condition class was determined to be stable in 2003.

Wyoming big sagebrush is the prominent and key browse species. Its population increased from 3,633 to 5,799 plants/acre between 1982 and 1992. However, density declined to 4,860 plants/acre by 1998 due to a reduction in the number of young and decadent plants. The number of dead plants in the population more than accounts for the decrease in the estimated population. Utilization was light in 1982, but heavy in 1992 with many plants displaying a clubbed growth form and stunted growth. Overall vigor was good in 1992, although some plants showed disease and insect infestation. During the 1998 reading, utilization was more moderate, yet heavy use was still noted on 20% of the sagebrush. Reproduction was poor in 1998. Percent decadence declined slightly between 1992 and 1998, although the proportion of decadent shrubs classified as dying increased from 18% to 38% (400 to 600 plants/acre). Dead plants were also common at an estimated 1,380 plants/acre in 1998. During the 2003 reading, the population of Wyoming big sagebrush looked very poor after being subjected to several years of extreme drought. Weather station data from Enterprise show that only 38% of the normal precipitation fell in 2002. In addition, the last four spring periods (1999-2003) have been very dry averaging only 55% of normal. The spring of 2002 was exceptionally dry at 16% of normal and the spring of 2003 was 56% of normal (Utah Climate Summaries 2004). In 2003, the sagebrush population was estimated at 3,680 plants/acre, only a 24% decline since 1998. However, the portion of the population displaying poor vigor increased from 15% to 91% and the number of decadent plants increased from 33% to 93%. In addition, 96% or 3,280 plants/acre of the decadent plants sampled were classified as dying (>50% crown death). There are very few healthy plants on the site. Reproduction remains poor. Utilization was rated as heavy in 2003 but several lightly browsed plants also had considerable crown death.

The only other shrub of significance is stickleaf low rabbitbrush which numbered 920 plants/acre in 1998 and 880 plants/acre in 2003. These shrubs have also been effected by drought with increased poor vigor and decadence. Broom snakeweed and prickly pear are both present in small quantities, but pose little threat to the community at this time. The much larger sample used in 1998, picked up a few green ephedra which provide some additional forage. Pinyon and juniper trees are increasing down slope from the tree dominated hills to the east. Point-center quarter data from 1998 estimated 26 singleleaf pinyon and 32 Utah juniper trees/acre. Average basal diameter was estimated at 2.3 inches for pinyon and 6.8 inches for juniper. Photo point comparisons suggest an increase in density and size of the trees, but no point-quarter data is available from 1982 or 1992. Point-center quarter density data from 2003 show an increase in tree density to 31 pinyon and 57

juniper trees/acre. Average basal diameter was 3.2 inches for pinyon and 3.7 inches for juniper. This is still a relatively low density of trees on the site where total tree canopy cover was estimated at only 1.6% in 2003.

Perennial grasses and forbs occur infrequently and are of little significance as a forage source. The two most abundant perennial grasses are galleta grass and Sandberg bluegrass. Indian ricegrass and bottlebrush squirreltail are also fairly common. Cheatgrass brome was present in 1982 but not widespread. By 1998, it represented the most abundant grass on the site, providing 65% of the total grass cover and 63% of the total herbaceous cover. Sixweeks fescue was also fairly abundant in 1998. Annual grasses and forbs were not included in previous samples so no comparisons can be made. By 2003, drought conditions caused a dramatic decline in cheatgrass frequency and cover. Perennial grasses also declined in cover but only bottlebrush squirreltail declined significantly in nested frequency. Forbs are fairly diverse but are rare in their occurrence. Total forb cover averaged less than 1% in 1998 and 2003. The most common species are annuals.

### 1982 APPARENT TREND ASSESSMENT

The soil appears to be in a state of decline. Enough soil remains on the site to allow greater forage production than is currently available. The rate of erosion, while not rapid, is enough to result in a negative trend. Vegetative trend appears stable. Browse production is adequate, but the depleted understory lessens the value of this community. This site has a better potential for rehabilitation than similar sites in Bullion Canyon and near Newcastle Reservoir.

### 1992 TREND ASSESSMENT

Soil conditions have improved. Cover of bare ground has decreased from 48% in 1982 to 8% in 1992. Rock and pavement have stayed nearly the same, while both vegetation and litter cover have greatly increased. Erosion appears to have slowed and is not as great as reported before. All grass species have increased, but are normally utilized more during the fall and spring. Wyoming big sagebrush has increased, but shows signs of heavy use. The rate of decadence has increased to 37%. Stickyleaf low rabbitbrush is stable and doesn't appear to be increasing.

#### TREND ASSESSMENT

soil - up (5)

browse - slightly up (4)

herbaceous understory - slightly up (4)

### 1998 TREND ASSESSMENT

Soil trend is down slightly. Percent bare ground has increased from 8% to 18%, while litter cover has declined and pavement cover has increased from 4% to 23%. The increase in pavement cover suggests surface soil movement has occurred since 1992. Trend for browse is down slightly. Density of Wyoming big sagebrush has declined 16% since 1992 due to a reduction in young and decadent plants. The number of mature plants increased from 2,100 to 3,160 plants/acre. Utilization is more moderate, but the proportion of sagebrush displaying poor vigor has increased from 9% to 15%. Percent decadence has declined slightly from 37% to 33%. However, a greater number of decadent plants are classified as dying. Reproduction is currently poor. There are few seedlings, and young plants represent only 2% of the population which is not enough to replace the decadent/dying shrubs. Trend for the herbaceous understory is slightly down for grasses, although slightly up for forbs. Composition is still considered poor however. Cheatgrass dominates the herbaceous understory by providing 63% of the total herbaceous cover and perennial forbs are lacking. Overall, trend is considered slightly down since grasses provide the majority of the herbaceous cover.

### TREND ASSESSMENT

soil - down slightly (2)

browse - down slightly (2)

herbaceous understory - down slightly (2)

### 2003 TREND ASSESSMENT

This site has been greatly effected by drought which has caused downward trends in most areas. Soil trend is down slightly. There is actually less bare ground estimated but cover of pavement has increased from 23% to 32% and vegetation cover has declined twofold (44% to 20%). Litter cover actually increased but this is due to the abundance of dead sagebrush sampled in 2003. Overall, the ratio of protective cover to bare ground declined slightly. Erosion is still not a serious problem and the erosion condition class was determined to be slight in 2003. Trend for the key browse species, Wyoming big sagebrush, is down. Total population density declined only 24% yet the remaining shrubs are nearly all decadent and dying. Only 220 relatively healthy mature sagebrush per acre were sampled. Decadent plants represented 93% of the 3,680 plants/acre estimated and 96% of these decadent plants were classified as dying (>50% crown death). Utilization was rated as heavy but this may have been overestimated due to the poor annual leader growth of most shrubs. There were many shrubs on site that were lightly browsed but still had significant crown death. Seedling and young recruitment is poor. Line-intercept cover of live sagebrush crowns was estimated at only 1.6% in 2003. A return to normal precipitation will help improve conditions here although most of the sagebrush on the site are likely too far gone to recover. Trend for the herbaceous understory is actually stable. Sum of nested frequency for perennial grasses remained similar to 1998 levels. The only negative aspect of the perennial grass trend is a significant decline in the nested frequency of bottlebrush squirreltail. Drought conditions also caused a significant decline in nested frequency of the cheatgrass. Cover of cheatgrass also declined from 18% in 1998 to less than one tenth of 1% in 2003. Forbs were fairly diverse in 1998 but they produced little cover (<1%). During the 2003 reading, fewer forbs were encountered even though average cover remained similar.

### TREND ASSESSMENT

soil - down slightly (2)

browse - down (1)

herbaceous understory - stable (3)

### HERBACEOUS TRENDS --

Management unit 30 , Study no: 29

Type	Species	Nested Frequency			Average Cover %	
		'92	'98	'03	'98	'03
G	Bromus tectorum (a)	-	<sub>b</sub> 368	<sub>a</sub> 35	18.18	.09
G	Hilaria jamesii	124	151	147	4.36	3.01
G	Oryzopsis hymenoides	26	30	19	1.47	.33
G	Poa secunda	77	85	104	2.15	1.79
G	Sitanion hystrix	<sub>c</sub> 151	<sub>b</sub> 36	<sub>a</sub> 1	1.02	.00
G	Vulpia octoflora (a)	-	<sub>b</sub> 150	<sub>a</sub> -	.98	-
Total for Annual Grasses		0	518	35	19.17	0.09

T y p e	Species	Nested Frequency			Average Cover %	
		'92	'98	'03	'98	'03
	Total for Perennial Grasses	378	302	271	9.01	5.16
	Total for Grasses	378	820	306	28.18	5.25
F	Arabis spp.	-	2	-	.03	-
F	Astragalus spp.	2	-	-	-	-
F	Castilleja linariaefolia	-	1	-	.03	-
F	Calochortus nuttallii	<sub>a</sub> 3	<sub>ab</sub> 16	<sub>b</sub> 22	.04	.06
F	Collomia linearis (a)	-	3	-	.00	-
F	Cryptantha spp.	<sub>a</sub> -	<sub>b</sub> 32	<sub>a</sub> -	.19	-
F	Cymopterus spp.	-	9	2	.02	.03
F	Descurainia pinnata (a)	-	<sub>b</sub> 24	<sub>a</sub> -	.08	-
F	Draba spp. (a)	-	<sub>b</sub> 14	<sub>a</sub> -	.05	-
F	Eriogonum cernuum (a)	-	2	-	.00	-
F	Eriogonum spp.	4	1	-	.03	-
F	Erigeron pumilus	3	7	-	.02	-
F	Gilia spp. (a)	-	49	27	.19	.36
F	Lupinus argenteus	-	4	-	.01	-
F	Navarretia intertexta (a)	-	37	29	.07	.10
F	Phlox longifolia	14	22	15	.08	.06
	Total for Annual Forbs	0	129	56	0.42	0.46
	Total for Perennial Forbs	26	94	39	0.44	0.15
	Total for Forbs	26	223	95	0.87	0.62

Values with different subscript letters are significantly different at alpha = 0.10

#### BROWSE TRENDS --

Management unit 30 , Study no: 29

T y p e	Species	Strip Frequency		Average Cover %	
		'98	'03	'98	'03
B	Artemisia tridentata wyomingensis	89	80	11.61	6.51
B	Chrysothamnus viscidiflorus viscidiflorus	32	31	1.56	2.55
B	Ephedra nevadensis	3	3	.00	.15
B	Gutierrezia sarothrae	1	0	.15	-
B	Juniperus osteosperma	2	4	-	-
B	Opuntia spp.	8	9	.91	.71
B	Pediocactus simpsonii	0	2	-	-
B	Pinus monophylla	1	2	1.41	1.70

B	Sclerocactus	1	0	-	-
Total for Browse		137	131	15.65	11.63

#### CANOPY COVER, LINE INTERCEPT --

Management unit 30 , Study no: 29

Species	Percent Cover '03
Artemisia tridentata wyomingensis	1.54
Chrysothamnus viscidiflorus viscidiflorus	1.28
Ephedra nevadensis	.03
Opuntia spp.	.86
Pinus monophylla	1.54

#### KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 30 , Study no: 29

Species	Average leader growth (in) '03
Artemisia tridentata wyomingensis	1.7

#### POINT-QUARTER TREE DATA --

Management unit 30 , Study no: 29

Species	Trees per Acre	
	'98	'03
Juniperus osteosperma	32	57
Pinus monophylla	26	31

Average diameter (in)	
'98	'03
6.8	3.7
2.3	3.2

#### BASIC COVER --

Management unit 30 , Study no: 29

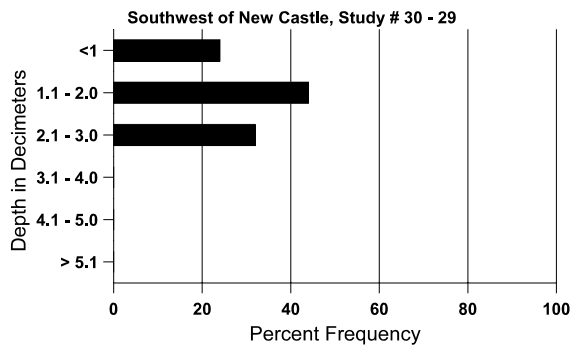
Cover Type	Average Cover %		
	'92	'98	'03
Vegetation	24.25	43.79	19.89
Rock	10.50	7.65	7.56
Pavement	3.75	22.60	31.62
Litter	54.00	30.99	35.59
Cryptogams	0	.39	.80
Bare Ground	7.50	18.28	12.09

# SOIL ANALYSIS DATA --

Management unit 30, Study no: 29, Study Name: Southwest of New Castle

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%OM	PPM P	PPM K	ds/m
15.2	65.4 (11.1)	6.4	54.0	21.4	24.6	1.6	9.4	105.6	0.6

## Stoniness Index



# PELLET GROUP DATA --

Management unit 30 , Study no: 29

Type	Quadrat Frequency		Days use per acre (ha)	
	'98	'03	'98	'03
Rabbit	31	22	-	-
Deer	54	51	68 (168)	58 (144)

# BROWSE CHARACTERISTICS --

Management unit 30 , Study no: 29

		Age class distribution (plants per acre)					Utilization				
Y	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Artemisia tridentata wyomingensis											
82	<b>3633</b>	500	533	2400	700	-	3	0	19	2	20/33
92	<b>5799</b>	100	1533	2100	2166	-	34	57	37	9	17/22
98	<b>4860</b>	40	100	3160	1600	1380	56	20	33	15	16/24
03	<b>3680</b>	40	40	220	3420	2440	9	85	93	91	13/20
Chrysothamnus viscidiflorus viscidiflorus											
82	<b>0</b>	-	-	-	-	-	0	0	0	0	-/-
92	<b>466</b>	-	100	366	-	-	0	0	0	0	11/11
98	<b>920</b>	-	60	860	-	20	0	0	0	0	12/18
03	<b>880</b>	-	20	300	560	140	0	2	64	41	10/13

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
<b>Ephedra nevadensis</b>											
82	<b>0</b>	-	-	-	-	-	0	0	-	0	-/-
92	<b>0</b>	-	-	-	-	-	0	0	-	0	-/-
98	<b>100</b>	-	20	80	-	-	80	0	-	0	10/21
03	<b>80</b>	-	-	80	-	-	0	25	-	25	8/12
<b>Gutierrezia sarothrae</b>											
82	<b>433</b>	-	-	433	-	-	46	0	-	0	8/7
92	<b>0</b>	-	-	-	-	-	0	0	-	0	-/-
98	<b>40</b>	20	-	40	-	-	0	0	-	0	-/-
03	<b>0</b>	-	-	-	-	-	0	0	-	0	-/-
<b>Juniperus osteosperma</b>											
82	<b>0</b>	-	-	-	-	-	0	0	-	0	-/-
92	<b>0</b>	-	-	-	-	-	0	0	-	0	-/-
98	<b>40</b>	-	40	-	-	-	0	0	-	0	-/-
03	<b>80</b>	-	80	-	-	-	0	0	-	0	-/-
<b>Opuntia spp.</b>											
82	<b>33</b>	-	-	33	-	-	0	0	0	0	4/17
92	<b>66</b>	-	-	66	-	-	0	0	0	0	5/14
98	<b>220</b>	-	20	200	-	-	0	0	0	0	7/13
03	<b>200</b>	-	-	180	20	-	0	0	10	10	8/23
<b>Pediocactus simpsonii</b>											
82	<b>0</b>	-	-	-	-	-	0	0	-	0	-/-
92	<b>0</b>	-	-	-	-	-	0	0	-	0	-/-
98	<b>0</b>	-	-	-	-	-	0	0	-	0	-/-
03	<b>60</b>	-	-	60	-	-	0	0	-	0	1/3
<b>Pinus monophylla</b>											
82	<b>0</b>	-	-	-	-	-	0	0	-	0	-/-
92	<b>0</b>	-	-	-	-	-	0	0	-	0	-/-
98	<b>20</b>	-	20	-	-	-	0	0	-	0	-/-
03	<b>40</b>	-	40	-	-	-	0	0	-	50	-/-
<b>Sclerocactus</b>											
82	<b>0</b>	-	-	-	-	-	0	0	-	0	-/-
92	<b>0</b>	-	-	-	-	-	0	0	-	0	-/-
98	<b>20</b>	-	-	20	-	-	0	0	-	0	-/-
03	<b>0</b>	-	-	-	-	-	0	0	-	0	1/2